

REMARKS

Claims 1-37 were previously pending in this application. Claims 1-2, 4-22, 27-28 and 30-37 have been amended herein. New claims 38-44 have been added. As a result, claims 1-44 are pending for examination with claims 1, 11, 18, 28 and 38 being independent claims. No new matter has been added.

Summary of Telephone Messages with Examiner

In a phone message, the Examiner was requested by the Applicants' attorney to clarify the Examiner's mention of a reference indicated as "French, et al." in the last paragraph of page 3 of the Office Action. French, et al. was mentioned by the first inventor's name, but included no further identification of the reference. In a return phone message, the Examiner indicated that inclusion of the paragraph referring to French, et al. was a "mistake" and should not have appeared in the Office Action. Accordingly, the Applicants do not address said paragraph herein, and the Applicants request that said paragraph be stricken from the record.

Rejections Under 35 U.S.C. §102

The Office Action rejected claims 1-4, 11-13, 18-19 and 28-31 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,335,124 to Mitsui, et al. (hereinafter Mitsui). The Office Action alleges that Mitsui teaches a method of manufacturing a halftone phase shift mask blank adapted for the preparation of a phase shift mask comprising the steps of forming a semitransparent film on a transparent substrate. The Office Action further alleges that the semitransparent film disclosed in Mitsui is capable of making a phase of light transmitted through the semitransparent film different from that of light transmitted directly through the transparent substrate by a predetermined amount, and reducing the intensity of light transmitted through the semitransparent film. The Office Action further alleges that the step of forming the transparent film, as disclosed in Mitsui, comprises a sputtering step using the sputtering target material comprising an element and a compound, said element being selected from the group consisting of metal elements and silicon. The Office Action states that Mitsui discloses that the element of the sputtering target material is selected from a group including palladium and platinum, *inter alia*.

Mitsui discloses a method of manufacturing halftone phase shift mask blanks, including a semitransparent film comprising at least one element selected from the group consisting of metal elements and transition elements, silicon and at least one compound selected from the group consisting of oxide, nitride, and oxynitride of these elements. The above composition is referred to by Mitsui as Constitution 1 (col. 4, lines 29-34). The semitransparent film layer formed by the combination of the above materials forms a single layer providing both attenuation and a suitable amount of phase delay (i.e., phase reversal, 180°).

Mitsui further discloses a series of additional Constitutions, each further specifying the nature of the components of the semitransparent film in Constitution 1. In particular, Constitution 6 indicates that the metal element or transition element is at least one element selected from the group including palladium and platinum, *inter alia* (col. 4, line 64 to col. 5, line 3).

Regarding Claims 1-4

Claim 1 has been amended to recite “an attenuation layer ... to attenuate the light... [and] a phase-delay layer, distinct from the attenuation layer” and that “the attenuation layer and the phase delay layer [are] adapted to combine to cause a phase reversal relative to light passing through a non-attenuated portion of the mask.” By contrast, Mitsui discloses the use of a structure consisting of only a single layer of semitransparent film that provides attenuation and the phase delay. Accordingly, claim 1 distinguishes over Mitsui and the rejection of claim 1 should be withdrawn.

Claims 2-4 depend from claim 1 and patentable for at least the same reason.

Regarding Claims 11-13

Claim 11 has been amended to recite “an attenuation layer to attenuate the light comprising platinum ... [and] a phase-delay layer, distinct from the attenuation layer... the attenuation layer and the phase delay layer being adapted to combine to cause a phase reversal relative to light passing through a non-attenuated portion of the mask.” By contrast, Mitsui discloses the use of a structure consisting of a single layer of semitransparent film that provides attenuation and the phase delay. Accordingly, claim 11 distinguishes over Mitsui and the rejection of claim 11 should be withdrawn.

Claims 12-13 depend from claim 11 and patentable for at least the same reason.

Regarding Claims 18-19

Claim 18 has been amended to recite a step of “depositing an attenuation layer comprising a native oxide-free, elemental metal, upon [a] substrate” and a step of “depositing a phase delay layer ... the attenuation layer and the phase delay layer being deposited so that they are adapted to combine to cause a phase reversal relative to light passing through a non-attenuated portion of the mask.” By contrast, Mitsui discloses depositing only a single layer of material to achieve both attenuation and phased delay. Accordingly, the rejection of claim 18 should be withdrawn.

Claim 19 depends from claim 18 and is patentable for at least the same reason.

Regarding Claims 28-31

Claim 28 has been amended to recite “an attenuation layer to attenuate [] light ... [and] a phase-delay layer, distinct from the attenuation layer ... the attenuation layer and the phase delay layer being adapted to combine to cause a phase reversal relative to light passing through a non-attenuated portion of the mask.” By contrast, Mitsui discloses the use of only a single layer of semitransparent film that provides both attenuation and the phase delay. Accordingly, claim 28 distinguishes over Mitsui and the rejection of claim 28 should be withdrawn.

Claims 29-31 depend from claim 28 and patentable for at least the same reason.

Regarding New Claim 38

New claim 38 recites “an attenuation layer to attenuate light consisting essentially of native oxide-free elemental metal.” By contrast, Mitsui discloses the use of a layer comprising a metal element, in combination with silicon, and at least one compound selected from a group consisting of oxide, nitride and oxynitride of the elements the combination of which provides attenuation and phase delay of Mitsui’s structure. Therefore, Mitsui does not disclose an attenuation layer consisting essentially of native oxide-free elemental metal. Accordingly, claim 38 distinguishes over Mitsui.

Rejections Under 35 U.S.C. §103

The Office Action rejected claims 1-37 under 35 U.S.C. §103(a) as being unpatentable over Mitsui in view of U.S. Patent No. 5,958,630 to Hashimoto, et al. (hereinafter Hashimoto).

The Office Action states that Mitsui is to be applied as in the above rejections under 35 U.S.C. §102. However, the Office Action acknowledges that Mitsui does not disclose the use of hydrogen silsesquioxane as the phase shift layer. The Office Action states that Hashimoto teaches a phase shift mask comprising a phase shifter made of hydrogen silsesquioxane, which alternately fills a plurality of opening sections arranged to be adjacent to one another, and is formed on a transparent substrate to have a predetermined film thickness. The Office Action alleges that it would have been obvious to one having ordinary skill in the art to use the teachings of Mitsui and combine them with the teachings of Hashimoto because it would have been obvious to use silsesquioxane as a phase shift material given that its usefulness has been demonstrated for the purposes of phase shifting.

The Combination of Mitsui and Hashimoto is Improper

As described above, Mitsui discloses a technique for producing a single layer halftone phase shift mask, in which a single layer of material is used to obtain both a desired amount of attenuation and a desired amount of phase shift. In the Background of the Invention, Mitsui discloses a number of different types of phase shift masks and indicates that a single layer-type halftone phase shift mask is simple to produce (col. 2, lines 12-16), but then states drawbacks of conventional single-layer masks. Mitsui then discloses a structure that is ostensibly an improved single layer halftone structure.

Hashimoto discloses a phase shift mask structure having opaque regions and transmitting regions, in which alternate transmitting regions (i.e., every other transmitting region) is filled with a transmissive, phase shifter material (col. 2, lines 40-48, also see FIG. 7D). Unlike the structure disclosed in Mitsui, in which a single layer structure provides both attenuation and phase shifting, the structure in Hashimoto is a two-layer structure, in which a phase shifter layer and an opaque layer are separate layers. Furthermore, Hashimoto discloses using a phase shifter in combination with an opaque layer, not for use in an attenuation layer such as the attenuation layer disclosed by Mitsui.


It is apparent from the above distinctions that Mitsui and Hashimoto teach very different structures. Accordingly, there is no motivation to combine Mitsui and Hashimoto in the manner described in the Office Action. In fact, Mitsui teaches away from adding a separate phase shifter layer, such as the layer described in Hashimoto, because the essence of Mitsui's invention is a single layer structure providing both attenuation and phase shifting. Accordingly, the combination of Mitsui and Hashimoto is improper and the rejection of claims 1-37 using such combination should be withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicants' attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,
Rothschild et al., Applicants

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